

DETAILED ACTION

Statutory Period for Reply

1. The shortened statutory period for reply to this non-final action has been shortened to 2 months because the petition under 37 CFR 1.181 was raised 1 month after the prior non-final rejection was mailed on 11/9/2011.

Election/Restrictions

REQUIREMENT FOR UNITY OF INVENTION

2. As provided in 37 CFR 1.475(a), a national stage application shall relate to one invention only or to a group of inventions so linked as to form a single general inventive concept ("requirement of unity of invention"). Where a group of inventions is claimed in a national stage application, the requirement of unity of invention shall be fulfilled only when there is a technical relationship among those inventions involving one or more of the same or corresponding special technical features. The expression "special technical features" shall mean those technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art.

3. The determination whether a group of inventions is so linked as to form a single general inventive concept shall be made without regard to whether the inventions are claimed in separate claims or as alternatives within a single claim. See 37 CFR 1.475(e).

WHEN CLAIMS ARE DIRECTED TO MULTIPLE CATEGORIES OF INVENTIONS

As provided in 37 CFR 1.475(b), a national stage application containing claims to different categories of invention will be considered to have unity of invention if the claims are drawn only to one of the following combinations of categories:

- (1) A product and a process specially adapted for the manufacture of said product; or
- (2) A product and process of use of said product; or
- (3) A product, a process specially adapted for the manufacture of the said product, and a use of the said product; or
- (4) A process and an apparatus or means specifically designed for carrying out the said process; or
- (5) A product, a process specially adapted for the manufacture of the said product, and an apparatus or means specifically designed for carrying out the said process.

4. Otherwise, unity of invention might not be present. See 37 CFR 1.475(c).

5. ***Restriction is required under 35 U.S.C. 121 and 372.***

6. This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.
7. In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claims 1-15, drawn to a metal evaporation heating element.

Group II, claim 16, drawn to the method of using a metal evaporation heating element

8. Groups I and II lacks unity because there is no single general inventive concept.

The unique special technical feature of Group I is the metal evaporation heating element with the structural limitations of claim 1. This is not a special technical feature because this feature is known in the prior art, as disclosed by Alexander (US 2,962,538) in view of Mandorf (US 3,181,968).

9. The unique special technical feature of Group II is using the metal evaporation heating element in a heated vacuum state. This is not a special technical feature because the metal evaporation heating element can be used outside of a heated vacuum state.

10. The examiner has required restriction between product and process claims. Where applicant elects claims directed to the product, and the product claims are subsequently found allowable, withdrawn process claims that depend from or otherwise require all the limitations of the allowable product claim will be considered for rejoinder. All claims directed to a nonelected process invention must require all the limitations of an allowable product claim for that process invention to be rejoined.

11. In the event of rejoinder, the requirement for restriction between the product claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37 CFR 1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the requirements of 35 U.S.C. 101, 102, 103 and 112. Until all claims to the elected product

are found allowable, an otherwise proper restriction requirement between product claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product claim will not be rejoined. See MPEP § 821.04(b). Additionally, in order to retain the right to rejoinder in accordance with the above policy, applicant is advised that the process claims should be amended during prosecution to require the limitations of the product claims. **Failure to do so may result in a loss of the right to rejoinder.** Further, note that the prohibition against double patenting rejections of 35 U.S.C. 121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See MPEP § 804.01.

Information Disclosure Statement

12. The information disclosure statement filed 9/4/2008 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because an English translation of the abstract of EP 0960956 has not been included. It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

Drawings

13. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "significant difference in the depth of the groove in one or between different grooves, deepest and shallowest groove locations" in claims 11, 13 and 14 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

14. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

15. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

16. The abstract of the disclosure is objected to because it is longer than 150 words.

Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 112

17. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

18. Claims 1-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

19. Regarding claim 1, lines 4-5 recite "comprising titanium diboride (TiB₂) and/or zirconium diboride (ZrB₂)", which the examiner considers as indefinite because it is unclear if zirconium diboride (ZrB₂) is included in the limitation. It is suggested to change "and/or" to either "and" or "or". Appropriate correction is required.

20. Regarding claim 6, lines 3 also recite "and/or". It is suggested to change "and/or" to either "and" or "or". Appropriate correction is required.
21. Regarding claim 11, the term "significant difference" is a relative term which renders the claim indefinite. The term "significant difference" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Appropriate correction is required.
22. Claims 4, 5, 7-10 and 12-15 are also rejected because they are dependent on rejected claim 1.

Claim Rejections - 35 USC § 103

23. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

24. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

25. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander (US 2,962,538) in view of Mandorf (US 3,181,968) and Goetz (US 6,120,286).

26. Regarding claim 1, Alexander teaches a metal evaporation heating element (Figs 3 & 4, Item 10, Col 3, Lines 33-37) characterized by having one or more grooves (Figs 3 & 4, Item 12a & 12b, Col 4, Lines 36-45) in a direction not in parallel with a current direction, on an upper surface of a ceramic sintered body (Figs 3 & 4, Item 10, Col 3, Lines 24-32, pre-sintered heating) comprising titanium diboride (Col 3, Lines 25-32, TiB₂) and/or zirconium diboride (ZrB₂), the groove has a width of from 0.1 to 1.5 mm (Figs 3 & 4, Item 12a & 12b, Col 3, Lines 45-50, 0.01 to 0.05 inch wide), a depth of from 0.03 to 1 mm (Col 3, Lines 45-50, 0.005 to 0.060 inch deep) and a length of at least 1 mm (Figs 3 & 4, Items 10 & 12, Col 3, Lines 38-43, width of 18 mm). Alexander discloses the claimed invention except for the ceramic body comprises titanium diboride and/or zirconium diboride (ZrB₂), and boron nitride (BN).

27. In analogous art of method of metal vaporization, Mandorf discloses the ceramic body comprises titanium diboride and/or zirconium diboride (Col 2, Lines 4-10), and boron nitride (Fig 1, Col 2, Lines 35-56 & Col 3, Lines 1-20) for the purpose of providing evaporating vessels made conductive by the presence therein of a refractory material and having suitable electrical conductivity and resistance to molten aluminum (Col 2, Lines 4-10). It would have been obvious to one having ordinary skill in the art at the time of the invention to combine the titanium diboride heating element of Alexander with the boron nitride of Mandorf for the purpose of providing evaporating vessels made

conductive by the presence therein of a refractory material and having suitable electrical conductivity and resistance to molten aluminum.

28. In analogous art of vaporizer boat for metal vaporizing, Goetz discloses as prior art, that the current direction flows through the vaporizer boat in a longitudinal direction (Figs 1 & 2, Items 5-7, Col 1, Lines 13-30 & Col 4, Lines 25-36) for the purpose of allowing the vaporizer boat to act as a heating resistor (Col 1, Lines 20-30). It would have been obvious for one having ordinary skill in the art at the time of the invention to combine the metal evaporation heating elements of Alexander and Mandorf with the current direction of Goetz for the purpose of allowing the vaporizer boat to act as a heating resistor

29. Regarding claim 2, Alexander teaches having at least two grooves with a distance of at most 2 mm (Figs 3 & 4, Item 12a & 12b, Col 3, Lines 45-50, 0.01 to 0.05 inch wide, 0.005 to 0.060 inch deep).

30. Regarding claim 3, Alexander teaches that the number of grooves is at least 10 (Figs 3 & 4, Item 12a & 12b).

31. Regarding claim 4, Alexander teaches that the direction not in parallel with the current direction makes an angle of from 20 to 160° with the current direction (Figs 3 & 4, Item 12a & 12b).

32. Regarding claim 5, Alexander teaches the grooves are crossed so as to form at least one intersection (Figs 3 & 4, Item 12a & 12b).

33. Regarding claim 6, Alexander teaches the ceramic sintered body (Figs 3 & 4, Item 10) has a cavity (Fig 5, Item 11, Col 3, Lines 38-41), and the groove is formed on

the bottom surface of the cavity (Figs 3 & 4, Items 12a & 12b) and/or on the upper surface of the ceramic sintered body.

34. Regarding claim 7, Alexander teaches a pattern is drawn by a plurality of grooves (Figs 3 & 4, Items 12a & 12b, Col 3, Lines 1-5) on the bottom surface of the cavity (Fig 5, Item 11) and/or on the upper surface of the ceramic sintered body.

35. Regarding claim 8, Alexander teaches the area ratio occupied by the pattern is at least 30% to the bottom surface area of the cavity with respect to one having a cavity (Col 3, Lines 40-50, see below for pattern to cavity area ratio calculation), or to the upper surface area of the ceramic sintered body with respect to one having no cavity.

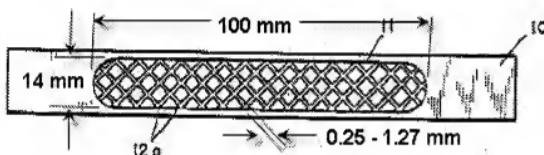


FIG. 3.

The examiners calculation of the ratio of the pattern area to the cavity area is as follows. The calculations are based on Alexander's dimensional disclosure (Col 3, Lines 40-50 and Fig 3 as shown above).

- Cavity Area = $(14 \times 100 \text{ mm}) = 1400 \text{ mm}^2$
- Area of 1 Groove = $(1.27 \text{ mm} \times 14 \text{ mm}) = 17.78 \text{ mm}^2$

The examiner uses 14 mm as the length of the groove, which is conservative because the length of the groove is more than 14 mm because the groove is at an angle.

c. Number of Grooves = 32

d. Pattern Area = Area of 1 Groove x Number of Grooves = $17.78 \times 32 = 568.96$
 mm^2

e. Pattern to Cavity Area Ratio = $(568.96 / 1400) \times 100 = 40.6\%$

36. Regarding claims 9 and 10, Alexander teaches that the area ratio occupied by the ratio is 40.6% and can be varied depending on the groove width and length (Col 3, Lines 40-50). Alexander, Mandorf and Goetz discloses the claimed invention except for the area ratio occupied by the pattern is at least 50 (Claim 9) and 80% (Claim 10). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the area ratio occupied by the pattern is at least 50 and 80%, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum are workable ranges involves only routine skill in the art. One would have been motivated to make the area ratio occupied by the pattern is at least 50 and 80% for the purpose of changing the wettability of the vaporizer element surface (Alexander, Col 2, Lines 36-72) (In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235).

37. Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander (US 2,962,538), Mandorf (US 3,181,968) and Goetz (US 6,120,286) as applied to claim 1, in view of Shinko (US 4,264,803).

38. Regarding claim 11, Alexander discloses the claimed invention except for in one groove, or between different grooves, a significant difference is provided in the depth of

the groove. Mandorf discloses in one groove, or between different grooves, a significant difference is provided in the depth of the groove (Fig 1, cavity is concaved which means there is a significant difference in the depth of the groove from the outside edges to the bottom central position).

39. In analogous art of resistance heated boat, Shinko also disclose in one groove, or between different grooves, a significant difference is provided in the depth of the groove (Figs 3 & 3A, Item 14, Col 1, Lines 59-64) for the purpose of assisting in containing the coating in the cavity area (Col 2, Lines 48-57). It would have been obvious for one having ordinary skill in the art at the time of the invention to modify the metal evaporation heating element of Alexander with the changing groove depth of Mandorf for the purpose of assisting in containing the coating in the cavity area.

40. Regarding claim 12, Shinko discloses the significant difference in the depth of the groove is at least 10% (Figs 3 & 3A, Item 14) for the purpose of assisting in containing the coating in the cavity area (Col 2, Lines 48-57). It would have been obvious for one having ordinary skill in the art at the time of the invention to modify the metal evaporation heating element of Alexander with the changing groove depth of Mandorf for the purpose of assisting in containing the coating in the cavity area.

41. Regarding claim 13, Alexander teaches a plurality of grooves (Fig 1, Items 12), a groove is provided at a center portion in the longitudinal direction of the ceramic sintered body (Fig 1, Item 10) or in the vicinity thereof. Alexander, Mandorf and Goetz discloses the claimed invention except for the groove having the deepest portion is provided at a center portion.

42. In analogous art of resistance heated boat, Shinko discloses the cavity having a concaved shaped (Figs 1 & 3, Items 12 & 14, Col 1, Lines 59-64) for the purpose of for the purpose of assisting in containing the coating in the cavity area (Col 2, Lines 48-57). It would have been obvious for one having ordinary skill in the art at the time of the invention to combine the grooves of Alexander with the changing cavity depth of Shinko for the purpose of assisting in containing the coating in the cavity area. The examiner interprets that if the grooves of Alexander are added to the concaved cavity of Shinko, the central groove will be the deepest.

43. Regarding claim 14, Alexander teaches a plurality of grooves (Fig 1, Items 12), a groove is provided at one end or each end in the longitudinal direction of the ceramic sintered body (Fig 1, Item 10). Alexander, Mandorf and Goetz discloses the claimed invention except for the groove having the shallowest portion is provided at one end or each end.

44. In analogous art of resistance heated boat, Shinko discloses the cavity having a concaved shaped (Figs 1 & 3, Items 12 & 14, Col 1, Lines 59-64) for the purpose of for the purpose of assisting in containing the coating in the cavity area (Col 2, Lines 48-57). It would have been obvious for one having ordinary skill in the art at the time of the invention to combine the grooves of Alexander with the changing cavity depth of Shinko for the purpose of assisting in containing the coating in the cavity area. The examiner interprets that if the grooves of Alexander are added to the concaved cavity of Shinko, the outside grooves will be the shallowest.

45. Regarding claim 15, Alexander, Mandorf and Goetz discloses the claimed invention except for the (depth of the deepest portion of the groove) - (depth of the shallowest portion of the groove) is at least 0.005 mm. In analogous art of resistance heated boat, Shinko discloses the (depth of the deepest portion of the groove) - (depth of the shallowest portion of the groove) is at least 0.005 mm (Fig 1 & 3, Items 12 & 14, Col 4, Lines 5-10, 0.257 inches deep [0.01 mm]) for the purpose of assisting in containing the coating in the cavity area (Col 2, Lines 48-57). It would have been obvious for one having ordinary skill in the art at the time of the invention to modify the metal evaporation heating element of Alexander with the changing groove depth of Mandorf for the purpose of assisting in containing the coating in the cavity area.

Conclusion

46. Any inquiry concerning this communication or earlier communications from the examiner should be directed to THIEN S. TRAN whose telephone number is (571)270-7745. The examiner can normally be reached on Mon-Friday, 8-5PM EST.

47. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tu Hoang can be reached on 571-272-4780. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

48. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/THIEN S TRAN/
Examiner, Art Unit 3742
1/20/2012

/Henry Yuen/
Supervisory Patent Examiner, Art
Unit 3742